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SURFACE TRANSPORTATION BOARD

DECISION

Docket No. EP 664 (Sub-No. 4)

REVISIONS TO THE BOARD'S METHODOLOGY FOR DETERMINING THE RAILROAD INDUSTRY'S COST OF CAPITAL

Decided: September 30, 2019

AGENCY: Surface Transportation Board.

ACTION: Notice of Proposed Rulemaking.

SUMMARY: The Board proposes to incorporate an additional model to complement its use of the Morningstar/Ibbotson Multi-Stage Discounted Cash Flow Model (MSDCF) and the Capital Asset Pricing Model (CAPM) in determining the cost-of-equity component of the cost of capital.

DATES: Comments on the proposed rule are due by November 5, 2019. Reply comments are due by December 4, 2019.

ADDRESSES: Comments and replies must be filed with the Board either via e-filing or in writing addressed to: Surface Transportation Board, Attn: Docket No. EP 664 (Sub-No. 4), 395 E Street, S.W., Washington, DC 20423-0001. Written comments and replies will be posted to the Board's website at www.stb.gov.

FOR FURTHER INFORMATION CONTACT: Nathaniel Bawcombe at (202) 245-0376. Assistance for the hearing impaired is available through the Federal Relay Service at (800) 877-8339.

SUPPLEMENTARY INFORMATION: Each year, the Board determines the railroad industry's cost of capital and then uses this figure in a variety of regulatory proceedings, including the annual determination of railroad revenue adequacy, rate reasonableness cases, feeder line applications, rail line abandonments, trackage rights cases, and rail merger reviews. The annual cost-of-capital figure is also used as an input in the Uniform Railroad Costing System, the Board's general purpose costing system.

The Board calculates the cost of capital as the weighted average of the cost of debt and the cost of equity. See Methodology to be Employed in Determining the R.R. Indus.'s Cost of Capital, EP 664, slip op. at 3 (STB served Jan. 17, 2008). While the cost of debt is observable and readily available, the cost of equity (the expected return that equity investors require) can

only be estimated.[1] Id. Thus, "estimating the cost of equity requires relying on appropriate finance models." Pet. of the W. Coal Traffic League to Inst. a Rulemaking Proceeding to Abolish the Use of the Multi-Stage Discounted Cash Flow Model in Determining the R.R. Indus.'s Cost of Equity Capital, EP 664 (Sub-No. 2), slip op. at 2 (STB served Oct. 31, 2016).

In 2009, the Board moved from a cost-of-equity estimate based solely on CAPM to a cost-of-equity estimate based on a simple average of the estimates produced by CAPM and Morningstar/Ibbotson MSDCF. See Use of a Multi-Stage Discounted Cash Flow Model in Determining the R.R. Indus.'s Cost of Capital, EP 664 (Sub-No. 1), slip op. at 15 (STB served Jan. 28, 2009). In that decision, the Board cited to the Federal Reserve Board's testimony in Methodology to be Employed in Determining the Railroad Industry's Cost of Capital, Docket No. EP 664, which stated that the use of multiple models "will improve estimation techniques when each model provides new information." Use of a Multi-Stage Discounted Cash Flow Model, EP 664 (Sub-No. 1), slip op. at 15. Furthermore, the Board stated that "there is robust economic literature confirming that, in many cases, combining forecasts from different models is more accurate than relying on a single model."[2]

Under CAPM, the cost of equity is equal to $RF + \beta \times RP$, where RF is the risk-free rate of interest,[3] RP is the market-risk premium, and β (or beta) is the measure of systematic, non-diversifiable risk. Under CAPM, the Board calculates the risk-free rate based on the average yield to maturity for a 20-year U.S. Treasury Bond. The estimate for the market-risk premium is based on returns experienced by the S&P 500 since 1926. Lastly, beta is calculated by using a portfolio of weekly, merger-adjusted railroad stock returns for the prior five years.

Under Morningstar/Ibbotson MSDCF, the cost of equity is the discount rate that equates a firm's market value to the present value of the expected stream of cash flows. Morningstar/Ibbotson MSDCF calculates growth of earnings in three stages. In the first stage (years one through five), the qualifying railroad's[4] annual earnings growth rate is assumed to be

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[1] The Board must make "an adequate and continuing effort to assist those carriers in attaining revenue levels," which should, among other objectives, "permit the raising of needed equity capital." 49 U.S.C. § 10704(a)(2).

[2] Use of a Multi-Stage Discounted Cash Flow Model, EP 664 (Sub-No. 1), slip op. at 15 (citing David F. Hendry & Michael P. Clements, Pooling of Forecasts, VII Econometrics Journal 1 (2004); J.M. Bates & C.W.J. Granger, The Combination of Forecasts in Essays in Econometrics: Collected Papers of Clive W.J. Granger, Vol. I: Spectral Analysis, Seasonality, Nonlinearity, Methodology, & Forecasting 391-410 (Eric Ghysels, Norman R. Swanson, & Mark W. Watson, eds., 2001); Spyros Makridakis & Robert L. Winkler, Averages of Forecasts: Some Empirical Results, XXIX Management Science 987 (1983)).

[3] The risk-free rate of interest is an exogenously determined interest rate at which investors may borrow or lend without fear of default.

[4] The Board determines the railroad industry's cost of capital for a "composite railroad," which is based on data from Class I carriers that meet certain criteria developed in Railroad Cost

the median value of its three- to five-year growth rate estimates, as determined by railroad industry analysts and published by the Institutional Brokers Estimate System.[5] In the second stage (years six through 10), the growth rate is the simple average of all of the qualifying railroads' median three- to five-year growth rate estimates in stage one. In the third stage (years 11 and onwards), the growth rate is the long-run nominal growth rate of the U.S. economy. This long-run nominal growth rate is estimated by using the historical growth in real Gross Domestic Product plus the long-run expected inflation rate.

Proposed Rule

The Board proposes to add an additional model, which the Board will refer to as "Step MSDCF" to the cost-of-capital calculation, as described below.[6] Consistent with the Board's present methodology, in which CAPM and MSDCF approaches each comprise 50% of the cost-of-equity estimate, the Board proposes to calculate the cost of capital by using the weighted average of the three models, with CAPM weighted at 50%, Morningstar/Ibbotson MSDCF weighted at 25%, and Step MSDCF weighted at 25%.

As the Board has stated previously, there is no single simple or correct way to estimate the cost of equity for the railroad industry, and many model options are available. Use of a Multi-Stage Discounted Cash Flow Model, EP 664 (Sub-No. 1), slip op. at 15; see also Pet. of the W. Coal Traffic League, EP 664 (Sub-No. 2), slip op. at 2, 20 (STB served Oct. 31, 2016). The Board has acknowledged that "by using multiple models that are based on different perspectives and rely on different inputs, the Board benefits because anomalies affecting one model are less likely to affect the other." Pet. of the W. Coal Traffic League, EP 664 (Sub-No. 2), slip op. at 3 (STB served Apr. 28, 2017). The Board has previously determined that a methodology that uses multiple models is more robust than a methodology that utilizes only one model, not because one model is "conceptually or pragmatically superior to the other," but rather because each has different strengths and weaknesses. Pet. of the W. Coal Traffic League, EP 664 (Sub-No. 2), slip op. at 11 (STB served Oct. 31, 2016). Accordingly, the Board finds that its cost-of-capital determinations could be strengthened by the addition of a new model to improve the robustness of its calculations.

Since 2009, the Board has found that the simple average of CAPM and Morningstar/Ibbotson MSDCF has produced a reasonable estimate of the cost of equity used to gauge the financial health of the railroad industry. Most recently, in Railroad Cost of Capital—2018, EP 558 (Sub-No. 22), slip op. at 2-3 (STB served Aug. 6, 2019), discussed in more detail below, the Board once again affirmed this established methodology as reasonable. However, in

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of Capital—1984, 1 I.C.C.2d 989 (1985), as modified by Revisions to the Cost-of-Capital Composite Railroad Criteria, EP 664 (Sub-No. 3) (STB served Oct. 25, 2017).

[5] This data can be retrieved from Refinitiv (formerly Thomson ONE Investment Management). See Railroad Cost of Capital—2018, EP 558 (Sub-No. 22), slip op. at 9 (STB served Aug. 6, 2019)

[6] Step MSDCF is similar to the model presented in Aswath Damodaran, Investment Valuation: Tools & Techniques for Determining the Value of Any Asset 317 (3d ed. 2012).

that decision, the Board also noted that, when appropriate, the Board has undertaken an examination of whether changes to its cost-of-capital methodology may be warranted, and stated that it expected to open a proceeding to further explore whether modifications to its cost-of-capital methodology may be appropriate. Id. at 3.

In the proceeding to update the railroad industry's cost of capital for 2018, the Board received comments from the Association of American Railroads (AAR) providing the information used to make the annual cost-of-capital determination. See generally AAR Comments, Apr. 22, 2019, R.R. Cost of Capital—2018, EP 558 (Sub-No. 22). The supporting data submitted with AAR's filing reflected a significant increase in growth rates[7] and the cost of capital. Specifically, the 2018 cost of capital (12.22%) is 2.18 percentage points higher than the 2017 cost of capital (10.04%). According to AAR, lower tax rates and rail operating changes, among other factors, contributed to analysts' higher growth expectations.[8] At present, three of the four qualifying railroads included in the Board's cost-of-capital calculations have implemented some form of operating changes, which are generally referred to as "precision scheduled railroading."[9]

Significant operating changes that occur over a relatively short period of time can have a unique effect on the Board's annual cost-of-capital determination, particularly if they are neither one-time events[10] nor expected to cause permanent changes in the industry's growth rates. Once

[7] The second stage growth rate estimate produced by Morningstar/Ibbotson MSDCF (i.e., the average of the qualifying railroads' individual three- to five-year median growth rates) produced a value of 19.88%, which is significantly higher than the second stage growth rate value of 13.55% reflected in the 2017 cost-of-capital decision. See R.R. Cost of Capital—2018, EP 558 (Sub-No. 22), slip op. at 17; R.R. Cost of Capital—2017, EP 558 (Sub-No. 21), slip op. at 18 (STB served Dec. 6, 2018). Likewise, CSX Corporation's first stage growth rate rose significantly from 15.66% in 2017 to 27.43% in 2018. See R.R. Cost of Capital—2018, EP 558 (Sub-No. 22), slip op. at 17; R.R. Cost of Capital—2017, EP 558 (Sub-No. 21), slip op. at 18.

[8] See AAR Comments, V.S. John Gray 45-46, Apr. 22, 2019, R.R. Cost of Capital—2018, EP 558 (Sub-No. 22) ("Based on train-miles reported in Annual Report Form R-1, 2015 and 2016 were recession years for the railroad industry, and train-miles have not yet recovered to 2014 levels – even if unit trains (mostly coal) are excluded. Thus, it is not surprising that analysts now have higher growth expectations, especially when considering other factors such as lower tax rates and the implementation of precision scheduled railroading.").

[9] See Letter from E. Hunter Harrison, then-Chairman & Chief Exec. Officer, CSX Corp., in response to August 14, 2017 letter from Board Members, at 1, www.stb.gov (open "Rail Service Data" under "Quick Links" and select "CSX Response, Service Outlook and Milestones, August 24, 2017" hyperlink); see also, U.S. Dept. of Agric. Grain Transp. Report 2 (Dec. 20, 2018), http://dx.doi.org/10.9752/TS056.12-20-2018.

[10] For example, significant operating changes like precision scheduled railroading are not like the enactment of the Tax Cuts and Jobs Act, Pub. L. No. 115-97, 131 Stat. 2054 (2017), which was a one-time occurrence that merited a one-time adjustment to the cost of capital.

significant operating changes are fully implemented, any rate of growth that accompanied the operating changes may not continue to increase at the same level. Because the operating changes will, and future railroad changes that are currently unknown could, have a significant impact on the Board's cost-of-capital determination, the Board finds that now is an appropriate time to consider the addition of a model that could improve its methodology for estimating the cost-of-equity component of the cost of capital.

As described in more detail below, the Board finds that the addition of Step MSDCF, when used in combination with the current Morningstar/Ibbotson MSDCF and CAPM, could enhance the robustness of the resulting cost-of-equity estimate during periods, like the present one, in which certain railroads are undertaking significant operating changes. Furthermore, consistent with the Board's previous finding, supported by extensive economic literature, that averaging multiple models—based on different perspectives, relying on different inputs, and with different strengths and weaknesses—would produce estimates that are more robust when averaged together,[11] the addition of Step MSDCF would improve the cost-of-capital determination, including during periods of significant operating changes.

Like Morningstar/Ibbotson MSDCF, Step MSDCF proposed here would continue to calculate growth of earnings in three stages. The first and third stages would be identical to those of Morningstar/Ibbotson MSDCF. In the first stage (years one through five), the qualifying railroad's annual earnings growth rate would be the median value of its three- to five-year growth rate estimates and, in the third stage (years 11 and onwards), the growth rate would be the long-run nominal growth rate of the U.S. economy. The growth rate of the second stage (years six through 10) would be a gradual transition between the first and third stages. The transition would begin at year six and step down or up in equal increments each year towards the terminal growth rate (or third stage). The algebraic formula for Step MSDCF is described in full in Appendix A.

The Board proposes to add Step MSDCF to its cost-of-capital methodology based in part on input from commenters in prior proceedings. Since the Board's adoption of its current hybrid methodology in 2009, Western Coal Traffic League (WCTL) has opposed the Board's use of Morningstar/Ibbotson MSDCF in its cost-of-equity calculation. One of WCTL's primary criticisms has been that using the average of all of the qualifying railroads' median growth rates in stage one as the growth rate in stage two is unreasonable because three- to five-year forecasts of earnings growth will not likely be accurate for ten years. See Use of a Multi-Stage Discounted Cash Flow Model, EP 664 (Sub-No. 1), slip op. at 8-9. Additionally, WCTL has argued that Morningstar/Ibbotson MSDCF lacks a transition mechanism, which prevents smooth transitions between stages. See Pet. of the W. Coal Traffic League, EP 664 (Sub-No. 2), slip op. at 9 (STB served Oct. 31, 2016).

See R.R. Revenue Adequacy—2017 Determination, EP 552 (Sub-No. 22) et al., slip op. at 1-3 (STB served Dec. 6, 2018).

[11] See Pet. of the W. Coal Traffic League, EP 664 (Sub-No. 2), slip op. at 11 (STB served Oct. 31, 2016).

In affirming the reasonableness of Morningstar/Ibbotson MSDCF's second-stage growth rate, the Board has noted that (1) the returns of individual firms should revert to the industry average over time, (2) it is not realistic to predict growth for individual companies beyond five years, and (3) attempting to create smoother transitions between the stages would add more complexity to the model but would not guarantee more precision, in part, because the cost of equity cannot ever be truly known. See Pet. of the W. Coal Traffic League, EP 664 (Sub-No. 2), slip op. at 13 (STB served Oct. 31, 2016). The Board continues to believe that Morningstar/Ibbotson MSDCF is reasonable. At the same time, there are other reasonable models based on different perspectives, relying on different inputs, and with different strengths and weaknesses. Forecasting growth rates in years six through 10 is inherently imprecise, and it is not possible to predict whether one model will better reflect future events, particularly when those events must be judged over decades of differing market characteristics. The Board's proposal to incorporate another model to improve the robustness of its overall cost-of-equity estimate implies neither that the Board expects to achieve perfect precision across models nor that the Board's existing models are inadequate. The Board finds it is reasonable to continue to rely on Morningstar/Ibbotson MSDCF as one aspect of its cost-of-capital methodology.

Even so, the Board recognizes that the significant operating changes undertaken by certain individual railroads have given those railroads a significant increase in growth rates that flows through to the second stage of Morningstar/Ibbotson MSDCF, and it is always possible that future railroad changes could have a similar effect. Specifically, because the second-stage growth rate in Morningstar/Ibbotson MSDCF uses the simple average of all qualifying railroads' three- to five-year median growth rate estimates from the first stage, the growth rates in the middle horizon (years six through 10) will be similar to the averages of growth rates in the short term (three- to five-year estimates). By drawing upon the three- to five-year growth rate estimates twice, Morningstar/Ibbotson MSDCF is more sensitive to growth rate changes in the short term, which may involve anomalous increases or decreases, relative to a model with a gradual transition between the first and third stages. While reasonable, Morningstar/Ibbotson MSDCF may not capture information relevant to the middle horizon in the same way as other models.[12] Therefore, the Board's cost-of-equity estimate could yet be made more robust by adding a model, like Step MSDCF, that reflects a different perspective for the middle horizon.[13]

[12] The Board has repeatedly rejected WCTL's argument that Morningstar/Ibbotson MSDCF should be abandoned due to what WCTL argues is its flawed second-stage growth rate, but the Board has not previously considered how a MSDCF variation with a different second-stage growth rate could supplement Morningstar/Ibbotson MSDCF. The Board proposes that Step MSDCF could be useful as a supplement, rather than a replacement, for Morningstar/Ibbotson MSDCF because, while Step MSDCF adds a different perspective with respect to growth rates, Step MSDCF may not necessarily be more reasonable than Morningstar/Ibbotson MSDCF in certain periods or over the long term.

[13] In comments submitted for the 2018 cost-of-capital proceeding, AAR stated that Morningstar/Ibbotson MSDCF "assumes 'that over a middle horizon, growth of any particular company will lie more in line with the industry as a whole," which means that "other companies 'catch' their industry growth leaders, or the leaders fall back to the rate of the slower growth railroads." Accordingly, AAR argued that "[a]ny attempt to change the second stage to a

The Board proposes to retain the same CAPM that it has used to calculate the cost of capital since 2008. See Methodology to be Employed in Determining the R.R. Indus.'s Cost of Capital, EP 664, slip op. at 2. The Board's current methods for determining the railroad industry's beta and estimating market-risk premium are reasonable. Furthermore, recent operating changes have not demonstrated similar issues in the cost-of-equity estimates produced by CAPM as they have for Morningstar/Ibbotson MSDCF. Accordingly, the Board proposes that to reduce the impact of short-term operating changes on the cost of capital, it is not necessary for the Board to modify CAPM.

CAPM, generally, is a backward-looking model while MSDCF is more forward-looking, each looking at different market data. R.R. Cost of Capital—2018, EP 558 (Sub-No. 22), slip op. at 3. To maintain an equal balance between forward-looking and backward-looking models, the Board proposes to use a weighted average of the three models in its cost-of-equity calculation, with CAPM weighted at 50%, Morningstar/Ibbotson MSDCF weighted at 25%, and Step MSDCF weighted at 25%. Furthermore, because the Board has not found that MSDCF is superior to CAPM, or vice versa, it is reasonable to use a weighted average of the three models that allows both model types to continue to contribute equally to the cost of equity.

When applied over a 10-year historical analysis period, the weighted average of the three models results in a lower variance than a forecast relying on the average of CAPM and Morningstar/Ibbotson MSDCF alone. For the period 2009 through 2018, the average of CAPM and Morningstar/Ibbotson MSDCF produces a cost of equity ranging from 10.31% to 13.86% with a standard deviation of 1.18. Over the same period, the weighted average of the three models produces estimates between 10.25% and 13.46% with a standard deviation of 1.09. See Appendix B.

Adding Step MSDCF to the Board's current methodology for calculating the cost of capital is consistent with the Rail Transportation Policy. 49 U.S.C. § 10101. For instance, having a methodology that more robustly estimates the cost-of-equity component of the cost of capital would better ensure that rail carriers are allowed to earn adequate revenues. § 10101(3); see also Standards for R.R. Revenue Adequacy, 364 I.C.C. 803, 811 (1981), aff'd sub nom. Bessemer & Lake Erie R.R. v. ICC, 691 F.2d 1104 (3d Cir. 1982) (concluding that "the only revenue adequacy standard consistent with the requirements of [The Staggers Rail Act of 1980] is one that uses a rate of return equal to the cost of capital"). As noted, Morningstar/Ibbotson MSDCF is more sensitive to growth rate changes in the short term relative

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transition stage is corrupting the intent of the model." AAR Comments, V.S. John Gray 45, Apr. 22, 2019, R.R. Cost of Capital—2018, EP 558 (Sub-No. 22). The Board does not propose to modify Morningstar/Ibbotson MSDCF in this decision. Instead, the Board proposes to add a new model that relies on different assumptions to be used alongside Morningstar/Ibbotson MSDCF. This approach allows the Board to introduce a model that will have a moderating influence on Morningstar/Ibbotson MSDCF while also maintaining the integrity of Morningstar/Ibbotson MSDCF.

to Step MSDCF, and Step MSDCF may be better suited for some periods, or even over the long run.

Interested parties are invited to comment on the proposed use of Step MSDCF described above in conjunction with CAPM and Morningstar/Ibbotson MSDCF currently used by the Board. Parties are encouraged to address issues such as the most appropriate way to integrate the three models into the cost-of-capital calculation, including the particular weighting that each model should have.

Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 (RFA), 5 U.S.C. §§ 601-612, generally requires a description and analysis of new rules that would have a significant economic impact on a substantial number of small entities. In drafting a rule, an agency is required to: (1) assess the effect that its regulation will have on small entities, (2) analyze effective alternatives that may minimize a regulation's impact, and (3) make the analysis available for public comment. §§ 601-604. In its notice of proposed rulemaking, the agency must either include an initial regulatory flexibility analysis, § 603(a), or certify that the proposed rule would not have a "significant impact on a substantial number of small entities," § 605(b). Because the goal of the RFA is to reduce the cost to small entities of complying with federal regulations, the RFA requires an agency to perform a regulatory flexibility analysis of small entity impacts only when a rule directly regulates those entities. In other words, the impact must be a direct impact on small entities "whose conduct is circumscribed or mandated" by the proposed rule. White Eagle Coop. v. Conner, 553 F.3d 467, 480 (7th Cir. 2009).

The Board certifies under 5 U.S.C. § 605(b) that this rule would not have a significant economic impact on a substantial number of small entities as defined by the RFA. Cost of capital is calculated for those Class I carriers that meet certain criteria developed in Railroad Cost of Capital—1984, 1 I.C.C.2d 989 (1985), and modified in Revisions to the Cost-of-Capital Composite Railroad Criteria, EP 664 (Sub-No. 3) (STB served Oct. 25, 2017). Therefore, the Board's proposed methodology will apply only to Class I rail carriers, and there will be no impact on small railroads. A copy of this decision will be served upon the Chief Counsel for Advocacy, Office of Advocacy, U.S. Small Business Administration, Washington, DC 20416.

It is ordered:

1. The Board proposes to revise its methodology for determining the railroad industry's cost of capital as set forth in this decision. Notice of this decision will be published in the Federal Register.

2. Comments are due by November 5, 2019. Reply comments are due by December 4, 2019.

3. A copy of this decision will be served upon the Chief Counsel for Advocacy, Office of Advocacy, U.S. Small Business Administration.

4. This decision is effective on its service date.

By the Board, Board Member Begeman, Fuchs, and Oberman.

APPENDIX A

This appendix presents the algebraic formula for Step MSDCF.

The cost of equity for each firm (r_i) in the step MSDCF is the solution to the following equation:

$$MV_{i0} = \sum_{t=1}^{5} \frac{CF_{i0}(1+g_{i1})^t}{(1+r_i)^t} + \sum_{t=6}^{10} \frac{CF_{i5}(1+Stepi1)^{(t-5)}}{(1+r_i)^t} + \frac{\underline{IBEI_{i10}(1+g_3)}}{\underline{r_i - g_3}} \frac{}{(1+r_i)^{10}}$$

Where,

MV_{i0} = market value of firm *i* in year 0 (that is, the year for which the cost of equity is being estimated)

CF_{it} = average cash flow for firm *i* at the end of year *t*

g_{i1} = earnings growth rate for firm *i* in stage 1

g_3 = long-run expected nominal growth rate of the U.S. economy

$Step_{ip}$ = the earnings growth rate for firm *i* in step *p* (*p* = 1, 2, 3, 4, or 5)

$Step_{i1} = g_{i1} - [(g_{i1}-g_3)/6]$

$Step_{i2} = Step_{i1} - [(g_{i1}-g_3)/6]$

$Step_{i3} = Step_{i2} - [(g_{i1}-g_3)/6]$

$Step_{i4} = Step_{i3} - [(g_{i1}-g_3)/6]$

$Step_{i5} = Step_{i4} - [(g_{i1}-g_3)/6]$

$IBEI_{it}$ = income before extraordinary items for firm *i* at the end of year *t*

$IBEI_{i10} = IBEI_{i0} (1+g_{i1})^5 (1+Step_{i1}) (1+Step_{i2}) (1+ Step_{i3}) (1+ Step_{i4}) (1+Step_{i5})$

$IBEI_{i0}$ is determined by the same process as CF_{i0}

The industry cost of equity (*R*) for the three-stage DCF model is computed as the market value weighted average of the individual firm cost of equity estimates:

$$R = \sum_{t=1}^{N} s_i r_i$$

Where, s_i is firm *i*'s share of the total industry market value and N is the number of firms in the industry composite, such that:

$$s_i = (MV_{0i}) / \sum_{t=1}^{N} MV_{0i}$$

APPENDIX B

The following chart compares the cost-of-equity estimates produced by the simple average of CAPM and Morningstar/Ibbotson MSDCF to the estimates produced by the proposed weighted average of CAPM (50%), Morningstar/Ibbotson MSDCF (25%), and Step MSDCF (25%) over the period 2009 through 2018.

Cost of Equity		
Year	Simple Average (CAPM, MSDCF)	Weighted Average (CAPM, MSDCF, Step MSDCF)
2009	12.37%	12.21%
2010	12.98%	12.81%
2011	13.57%	13.30%
2012	13.40%	13.16%
2013	12.96%	12.78%
2014	12.06%	11.87%
2015	10.96%	10.94%
2016	10.31%	10.25%
2017	11.46%	11.26%
2018	13.86%	13.46%